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stiff hairs, all pointing downward. The lower third of the interior is lined with slender bristles, the middle third is perfectly smooth, and the upper part is lined with hairs similar to those in the hood. But still the pitcher is open to the rain, secretes little or no honey, and absorbs the juices of the captured insects in the form of a liquid manure only.

Sarracenia flava shows a marked difference from the preceding, in that it secretes a nectar just below the hood. In *Sarracenia variolaris* (fig. 3), there is a wonderful advance. The hood bends over the orifice, thus shutting out the rain: it is marked on its posterior portion with white, translucent spots, and reticulations where honey is secreted; a secretion is formed at the bottom of the pitcher, which has the peculiar property of asphyxiating its victims: and a yet more striking advance is found to be a honey-baited pathway running from the ground up along the wing of the



FIG. 3.



FIG. 4.

leaf to the hood, and a short way into the orifice. A still further advance is found in *Darlingtonia*, a genus native to California. The hood forms a vaulted arch, mottled with spots and reticulations. The only entrance to the leaf is from below; and on each side of this entrance is a long appendage, the whole likened to a fish-tail (fig. 4). The inside of this secretes honey, and is covered with hairs. On the outside, running along the wing from the ground to the orifice, is a pathway of nectar which lures creeping insects to destruction, while the wings attract flying ones. A fluid secretion in the bottom of the cup has the power of decomposing the insects.

The flowers of these plants are also peculiarly modified for cross-fertilization; and the greatest amount of advance is found in the highest developed genus *Darlingtonia*, where the change has kept pace with the evolving leaves.

INSULAR FLORAS.

It is a large quarto volume which we have before us, dealing with the botany of sundry small islands which were visited by the Chal-

Report of the scientific results of the voyage of H.M.S. Challenger, during the years 1873-76. Botany, vol. i. London, Government, 1885. 4°.

lenger in her scientific cruise, made up of four reports, separately paged, and three indexes, and illustrated by sixty-five plates, which are consecutively numbered. With some arithmetical pains we ascertain that the letter-press occupies about 1,080 pages, counting in the leaves, one for each plate, upon which the figures are explained. A second volume is to contain the pelagic botany of the expedition. This one, under Mr. Hemsley's authorship, and devoted to the botany of the land and shores, concerns itself with the islands only, the continental collections of the cruise being too fragmentary, and of too well-known materials for any advantageous enumeration. Insular botany, however, has an interest of its own,—an interest quite independent of the size of the islands; for the botany even of small islands raises large and difficult questions. Moreover, their botany needs the most prompt attention; for it is everywhere undergoing rapid and irreparable deterioration and loss. At least four St. Helena plants once known to science have shared the fate of the dodo; several others are on the very eve of extinction; and no one knows how many have perished unknown and unconsecrated by scientific baptism. We are told in this volume that on St. Helena,—

"In 1709 trees still abounded, and one, the native ebony (*Melhania melanoxylon*), in such quantities that it was used to burn lime with. In 1745, however, the governor of the island reported to the court of directors of the East-India company that the timber was rapidly disappearing, and that the goats should be destroyed for the preservation of the ebony, and because the island was suffering from drought. He was instructed not to destroy the goats, as they were more valuable than ebony. Another century elapsed; and in 1810 another governor reports the total destruction of the great forests by the goats, which greedily devour the young plants, and kill the old by browsing on their leaves and bark; and that fuel was so scarce that the government paid for coal (and this in a tropical climate) £2,729 7s. 8d., annually. . . . About this time the goats were killed; but another enemy to the indigenous vegetation was at the same time introduced, which has now rendered it certainly impossible that the native plants [what are left of them] will ever again resume their sway. Major-Gen. Beatson proposed and carried out the introduction of exotic plants on a large scale."

The result of which is, that a foreign vegetation, chiefly European, Australian, and South African, of about sixty phenogamous species, and most of them worthless weeds, has taken the place of the native flora, nearly all of which was peculiar to the island, and which was known to have covered it with luxuriant forests down to the water's edge. The existing remnant of this peculiar flora lingers, rather than

survives, — the phenogamous part of it in only thirty-four species, — partly at some favored points near the sea, mainly in the higher and less accessible interior portions of the island. Of two or three of the trees or shrubs, only single specimens are known; while of the red-wood (*Melhania erythroxylon*, congener of the lost ebony, and no less valuable for the hard and durable mahogany-colored wood), which formerly abounded, only two indigenous trees survive, and hardly over a dozen planted ones.

Turning to the Bermudas, — the botany of which is exhaustively treated in the early part of the present volume, and, indeed, for the first time, — we have another example of the common fate of the aboriginal vegetation of small islands in low latitudes whenever opened to immigration. From the cultivated grounds, the indigenous vegetation is of course swept away: the uncultivated ground is covered with lantanas (here called sage-bushes) from the West Indies, and with oleanders from the Old World; also with an assortment of herbaceous weeds, some of American, but more of European, origin. The three shrubs above mentioned are said to cover more ground than all the native woody species put together. Yet the oleander was brought in only seventy years ago, the lantanas twenty or thirty years earlier.

But the change in Bermuda vegetation under human agency is by no means so striking and so pitiful as that which has happened to St. Helena. No peculiar type, and, it may be presumed, no species whatever, has here been extirpated. And that, because the Bermudas have no peculiar types, and probably never had any; and it is not improbable that the three or four species reckoned as peculiar may exist elsewhere. No genus, and hardly a well-marked species, would be lost if these little islands were submerged. Indeed, St. Helena and the Bermudas well represent the two classes of islands, the differences of which our author well describes. The first is an oceanic island, far separated by broad and deep seas from all continental land: its flora, therefore, in the main very peculiar and ancient, and the source of it wholly conjectural. Bermuda is of the continental class, is near to South America and the West Indies, from which it has obviously received its plants, and at a comparatively recent period. Like all such islands, its indigenous vegetation is meagre in kinds; and while 'the things themselves are neither rich nor rare,' it is not difficult to guess whence they came, and how they got there.

"The one striking feature in the softly undulating landscape is the ubiquitous cedar, re-

lieved here and there by clusters and isolated individuals of the palmetto." These are, indeed, the only indigenous trees in Bermuda. The palm (*Sabal Blackburniana*) is counted as endemic, yet with doubt whether it is not also West Indian. Its botanical history is curious, and is well worked out in this report; and so likewise of the cedar (*Juniperus Bermudiana*), which is also West Indian, and is very near to our common red cedar. Both trees appear to be in no danger of eradication; for they seed abundantly, and germinate freely.

The other insular floras, of which this volume collects and discusses the existing materials, are mainly those of Fernando de Noronha, Ascension, the Tristan da Cunha group, the Crozets and Kerguelen Island in the South Atlantic and Southern Oceans, Juan Fernandez and the adjacent MasaFuera, near Chili, the South-eastern Moluccas, and the Admiralty Islands. Of all these, the historical and bibliographical data are carefully worked up, and the bearings of the facts upon the problems of distribution briefly indicated.

The appendix, on the dispersal of plants by oceanic currents and birds, is a full compilation of what is known respecting such dispersion, — at least, for the regions with which these reports are concerned. A list of plants, certainly or probably dispersed by oceanic currents, is given on pp. 42–44 of the Introduction. This introductory essay upon the characteristics of insular floras, with an analysis of some of them, is, perhaps, the most widely interesting portion of the volume. Mr. Hemsley tells us of his hopes, that Sir Joseph Hooker would have undertaken this; but his multifarious duties rendered it impracticable for him now to address himself to this subject, which he has formerly discussed in the most masterly way, and with the advantage of the largest personal experience. The actual author, although new to the field, has made a creditable essay.

A. G.

SOME WORKS ON GEOLOGY AND GEOGRAPHY.

THE early issue of a second edition of Geikie's Geology bears witness to the success of this excellent work. The author's preface states that it has been thoroughly revised, and that by abridgment when possible, and by use of a different type from that of the first edition,

Text-book of geology. By ARCHIBALD GEIKIE. Second edition, revised and enlarged. London, 1885.
Physikalische geographie von Griechenland mit besondere rücksicht auf das Alterthum. By Dr. C. NEUMANN and Dr. J. PARTSCH. Breslau, Koebner, 1885. 476 p. 8°.